Hall Ticket Number :										

R-14

Code: 4G533

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2017

Basic Thermodynamics

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer all five units by choosing one question from each unit (5 x 14 = 70 Marks)

*****

UNIT–I

1. a) Explain clearly the difference between a non-flow and a steady flow process. 5M

   b) A mass of 2.4 kg of air at 150 kPa and 12°C is contained in a gas-tight, frictionless piston–cylinder device. The air is now compressed to a final pressure of 600 kPa. During the process, heat is transferred from the air such that the temperature inside the cylinder remains constant. Calculate the work input during this process. 9M

OR

2. a) What is the mechanical equivalent of heat? Write down its value when heat is expressed in kJ and work is expressed in N-m. 5M

   b) A house has an electric heating system that consists of a 300-W fan and an electric resistance heating element placed in a duct. Air flows steadily through the duct at a rate of 0.6 kg/s and experiences a temperature rise of 7°C. The rate of heat loss from the air in the duct is estimated to be 300 W. Determine the power rating of the electric resistance heating element. 9M

UNIT–II

3. a) A heat pump that is used to heat a house has a COP of 2.5. That is, the heat pump delivers 2.5 kWh of energy to the house for each 1 kWh of electricity it consumes. Is this a violation of the first law of thermodynamics? Explain. 5M

   b) A well-insulated rigid tank contains 2 kg of a saturated liquid–vapor mixture of water at 100 kPa. Initially, three-quarters of the mass is in the liquid phase. An electric resistance heater placed in the tank is now turned on and kept on until all the liquid in the tank is vaporized. Determine the entropy change of the steam during this process. 9M

OR

4. a) Derive Clausius – Clapeyron equation. What approximations are involved in the Clapeyron-Clausius equation? 6M

   b) A 200-m^3 rigid tank contains compressed air at 1 MPa and 300 K. Determine how much work can be obtained from this air if the environment conditions are 100 kPa and 300 K. 8M

UNIT–III

5. a) Describe the process of formation of steam and give its graphical representation also. 5M

   b) A spherical vessel of 0.9 m^3 capacity contains steam at 8 bar and 0.9 dryness fraction. Steam is blown off until the pressure drops to 4 bar. The valve is then closed and the steam is allowed to cool until the pressure falls to 3 bar. Assuming that the enthalpy of steam in the vessel remains constant during blowing off periods, determine :

   (i) The mass of steam blown off ;

   (ii) The dryness fraction of steam in the vessel after cooling ;

   (iii) The heat lost by steam per kg during cooling. 9M

OR

6. a) Draw a neat sketch of throttling calorimeter and explain how dryness fraction of steam is determined; clearly explain its limitations. 7M

   b) The following observations were taken with a separating and a throttling calorimeter arranged in series :

   Water separated = 2 kg, Steam discharged from the throttling calorimeter = 20.5 kg,

   Temperature of steam after throttling = 110°C, Initial pressure = 12 bar abs.,

   Barometer = 760 mm of Hg, Final pressure = 5 mm of Hg.

   Estimate the quality of steam supplied. 7M

UNIT–IV

7. a) Determine the value of compressibility factor at critical point (Z_{cp}) for the Van der Waals' gas. 6M

   b) A vessel of capacity $3m^3$ contains 1 kg mole of N_2 at 90°C.

      i. Calculate pressure and the specific volume of the gas.
      ii. If the ratio of specific heats is 1.4, evaluate the values of c_p and c_v.
      iii. Subsequently, the gas cools to the atmospheric temperature of 20°C; evaluate the final pressure of gas.
      iv. Evaluate the increase in specific internal energy, the increase in specific enthalpy, increase in specific entropy and magnitude and sign of heat transfer. 8M

OR

8. a) Calculate the increase in entropy when 3 kg of O_2 at 50°C are mixed with 9 kg of N_2 at the same temperature. The initial pressure of each constituent is 11 bar and is the same as that of the mixture. 7M

   b) The following is the volumetric analysis of a producer gas:

   CO = 28%, H_2 =13%, CH_4 = 4%, CO_2 = 4%, N_2 = 51%.

   The values of c_p for the constituents CO, H_2, CH_4, CO_2 and N_2 are 29.27 kJ/mole-K, 28.89 kJ/mole-K, 35.8 kJ/mole-K, 37.22 kJ/mole-K, and 29.14 kJ/mole-K respectively. Calculate the values of c_p, c_v, c_p and c_v for the mixture. 7M

UNIT–V

9. a) How is the rpm (revolutions per minute) of an actual four-stroke gasoline engine related to the number of thermodynamic cycles? What would your answer be for a two-stroke engine? 5M

   b) The compression ratio of an air-standard Otto cycle is 9.5. Prior to the isentropic compression process, the air is at 100 kPa, 35°C, and 600 cm^3. The temperature at the end of the isentropic expansion process is 800 K. Using specific heat values at room temperature, determine:

   (*i*) the highest temperature and pressure in the cycle;

   (*ii*) the amount of heat transferred in, in kJ;

   (*iii*) the thermal efficiency; and

   (*iv*) the mean effective pressure. 9M

OR

10. Consider a Carnot cycle executed in a closed system with air as the working fluid. The maximum pressure in the cycle is 800 kPa while the maximum temperature is 750 K. If the entropy increase during the isothermal heat rejection process is 0.25 kJ/kg - K and the net work output is 100 kJ/kg, determine:

    i. the minimum pressure in the cycle,
    ii. the heat rejection from the cycle, and
    iii. the thermal efficiency of the cycle.
    iv. If an actual heat engine cycle operates between the same temperature limits and produces 5200 kW of power for an air flow rate of 90 kg/s, determine the second law efficiency of this cycle. 14M

***

Hall Ticket Number :										

R-14

Code: 4G236

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2017

Electrical Engineering and Electronics Engineering

(Common to ME, CSE & IT)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

****

UNIT–I

1. a) Explain about different types of electrical elements? 7M

   b) Deduce the equivalent resistance when R_1,R_2 and R_3 are connected in parallel. 7M

OR

2. Derive the necessary equations for converting star to delta and Delta to star 14M

UNIT–II

3. a) With a neat sketch explain the constructional details and principle of operation of DC generator 10M

   b) Write the applications of DC generators 4M

OR

4. a) Explain the working principle of DC motor with a neat diagram 7M

   b) Derive the expression for torque of DC motor 7M

UNIT–III

5. a) How the efficiency of single phase transformer can be find out from the OC and SC tests. 14M

OR

6. a) Sketch the slip torque characteristics of three phase induction motor and explain 7M

   b) Describe the procedure required to find out the efficiency of three phase induction motor by using a brake test. 7M

UNIT–IV

7. a) What is a PN junction diode and explain the V-I characteristics of PN junction diode 7M

   b) What is rectifier and explain the operation of single phase half wave diode rectifier with a neat output waveforms 7M

OR

8. a) Draw and explain the input and output characteristics of CE amplifier 7M

   b) How transistor can be acts as an amplifier 7M

UNIT–V

9. a) Explain about induction and dielectric heating and mention its industrial applications 14M

OR

10. a) Draw the block diagram of CRO and explain 7M

    b) Explain any two applications of CRO 7M

***

Hall Ticket Number :										

R-14

Code: 4G532

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2017

Metallurgy & Material Science

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer all five units by choosing one question from each unit (5 x 14 = 70 Marks)

*****

UNIT–I

1. Explain about different Bonds in Solids.

OR

2. What is the necessity of alloying and explain its advantages.

UNIT–II

3. Explain about Experimental methods of construction of equilibrium diagrams.

OR

4. Explain about Lever rule and phase rule.

UNIT–III

5. Explain the structure and properties of White cast iron.

OR

6. Explain the structure and properties of copper and its alloys.

UNIT–IV

7. Explain about TTT diagram.

OR

8. What is the effect of alloying elements on Iron-Iron carbon system?

UNIT–V

9. What is composite material and explain different methods of production of composites.

OR

10. Explain about Electric Furnace process with neat sketch.

***

Hall Ticket Number :										

R-14

Code: 4GC31

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2017

Mathematics-II

(Common to CE & ME)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

****

UNIT–I

1. a) Find the rank of the matrix by reducing it to the normal form $\begin{bmatrix} 4 & 3 & 2 & 1 \\ 5 & 1 & -1 & 2 \\ 0 & 1 & 2 & 3 \\ 1 & -1 & 3 & -2 \end{bmatrix}$ 7M

b) Find the values of 'a' and 'b' for which the equations

$x+y+z=3;\ x+2y+2z=6;\ x+ay+3z=b$

have (**i**) No Solution (**ii**) a Unique Solution (**iii**) Infinite number of Solutions. 7M

OR

2. Find a Matrix P which transforms the matrix $A=\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$ to Diagonal form.

Hence Calculate A^4. Find the Eigen Values and Eigen Vectors of A. 14M

UNIT–II

3. a) Derive a formula to find the cube root of N using Newton- Raphson Method hence find the cube root of 15. 10M

b) Find the parabola passing through points $(0,1)\ (1,3)$ and $(3,55)$ using Newton Raphson Method Lagrange's interpolation formula. 4M

OR

4. Evaluate $\int_0^1 \sqrt{1+x^3}\,dx$ taking h = 0.1 using

i) Simpson's 1/3rd rule (**ii**) Simpson's 3/8th rule (**iii**) Trapezoidal rule. 14M

UNIT–III

5. Find $y(0.1), y(0.2)$ and $z(0.1), z(0.2)$ given that $y'=x+z$, $z'=x-y^2$ and $y(0)=2, z(0)=1$ by using Taylor's series method. 14M

OR

6. Apply the fourth order Runge-Kutta method, to find an approximate values of y when x= 1.2, in steps of 0.1, given that $y'=x^2+y^2$, y(1) = 1.5 14M

UNIT–IV

7. Find the Fourier series to represent the function $f(x) = x \sin x$, $-® < x < ®$.

Hence deduce that $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \frac{1}{7.9} + ... = \frac{1}{4}(® - 2)$ 14M

OR

8. a) Form the Partial differential equation by eliminating the arbitrary function from

$¤\left[\frac{y}{x},\ x^2 + y^2 + z^2\right] = 0$ 7M

b) Solve by the method of separation of variables $2xz_x - 3yz_y = 0.$ 7M

UNIT–V

9. a) If f(z) is a regular function of z, prove that

$$\left[\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right]\left|f(z)\right|^2 = 4\left|f'(z)\right|^2$$ 7M

b) Find k such that $f(x, y) = x^3 + 3kxy^2$ may be harmonic and find its conjugate. 7M

OR

10. Using Cauchy's integral formula, evaluate $\int_C \frac{z^4}{(z+1)(z-i)^2}\,dz$ where C is the ellipse $9x^2 + 4y^2 = 36.$ 14M

***

Hall Ticket Number :										

R-14

Code: 4G531

II B.Tech. I Semester Supplementary Examinations Nov/Dec 2017

Mechanics of Solids

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

****

UNIT–I

1. a) Prove that the maximum stress induced in a body due to suddenly applied load is twice the stress induced when the same load is applied gradually. 7M

   b) A steel bar is placed between two copper bars, each having the same area and length as steel bar at 20^0C.At this stage, they are rigidly connected together at both the ends. When the temperature is raised to 320^0C, the length of the bars increased by 1.5 mm. Determine the original length and final stresses in the bars. Take E_S=220GN/m^2;E_C=110 GN/m^2;α_S=0.000012 per^{0}C;α_C=0.0000175 per^{0}C. 7M

OR

2. a) Find an expression for the total elongation of a bar due to its own weight, when the bar is fixed at its upper end and hanging freely at its lower end. 7M

   b) An axial pull of 40000N is acting on a bar consisting of three sections of length 30cm,25 cm and 25 cm and diameters 2 cm,4 cm and 5 cm respectively. If the Young's modulus=2×10^5 N/mm^2, determine:

   (i) Stress in each section (ii) total extension in the bar. 7M

UNIT–II

3. a) What do you mean by point of contra flexure? Is the point of contra flexure and point of inflexion different? 7M

   b) A cantilever 2 m long is loaded with a uniformly distributed load of 2 kN/m run over a length of 1 m from the free end. It also carries a point load of 4 KN at a distance of 0.5 m from the free end. Draw the shear force and M.M. diagrams. 7M

OR

4. A simply supported beam of length 5 m, carries a uniformly distributed load of 100 N/m extending from the left end to a point 2 m away. There is also a clock wise couple of 1500 Nm applied at the centre of the beam. Draw the SF and B.M. diagrams for the beam and find the maximum bending moment. 14M

UNIT–III

5. a) What do you mean by section modulus? Find an expression for section modulus for rectangular, circular and hollow circular sections. 7M

   b) A steel pipe of width 60 mm and of thickness 10 mm is bent into a circular arc of radius 10 m. Determine the maximum stress induced and the bending moment which will produce the maximum stress. Take E=2×10^5 N/mm^2. 7M

OR

6. a) State the assumptions made in the theory of simple bending and derive the bending equations 7M

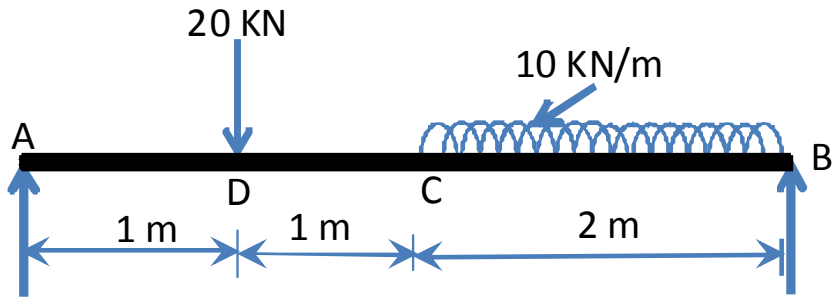
   b) A circular beam of 105 mm diameter is subjected to a shear force of 5 KN. Calculate average shear stress. maximum shear stress. Also sketch the variation of shear stress along the depth of beam. 7M

UNIT–IV

7. a) Derive an expression for the slope and deflection of a cantilever of length L, carrying a point load W at the free end by double integration method. 7M

b) A beam AB of 4 meters span is simply supported at the ends and is loaded as shown in the figure. Determine:

(i) Deflection at C
(ii) Maximum deflection
(iii) Slope at the end A
(iv) E=200×10^6 kN/m^2 and I=20×10^{-6} m^4. Use Macaulay's method



7M

OR

8. a) Prove that the strain energy stored in a body due to shear stress is given by

$U=\frac{\tau^2}{2C} \times V$

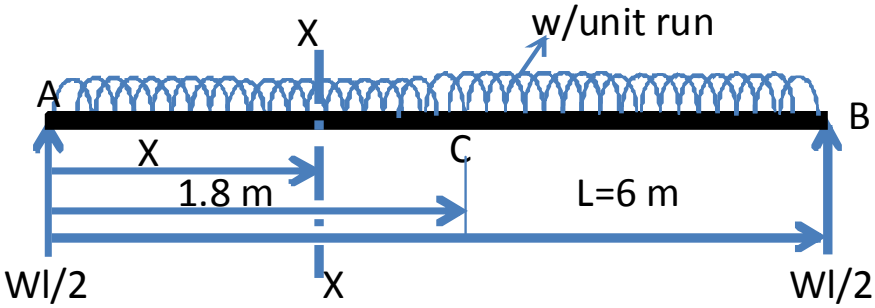
Where τ= shear stress

C=Modulus of rigidity

V= volume of the body 7M

b) A steel girder of 6 m length acting as a beam carries a uniformly distributed load w N/m run throughout its length. If I=30×10^{-6} m^4 and depth 270 mm, calculate:

(i) The magnitude of w so that the maximum stress developed in the beam section does no exceed 72 MN/m^2
(ii) The slope and deflection (under this load) in the beam at a distance of 1.8 m from one end.



7M

UNIT–V

9. a) Define slenderness ratio. State the limitations of Euler's formula. 7M

b) Determine the crippling load for a T- section of dimensions 10cm×10cm×2cm and of length 5 m when t is used as strut with both of its ends hinged. Take Young's modulus E=2.0×10^5 N/mm^2. 7M

OR

10. a) What do you mean by Lame's equation? How will you derive these equations? 7M

b) Determine the ratio of buckling strengths of two columns one hollow and the other solid. Both are made of the same material and have the same length, cross sectional area and end conditions. The internal diameter of hollow column is 2/3rd of its external diameter. 7M

***